

Application No. 09/726,082
Amendment "B" dated August 5, 2004
Reply to Office Action mailed June 3, 2004

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) In a computer system environment having at least one software component and at least one peripheral hardware device, a method for dynamically offloading, on a per-packet basis and depending on the then current needs of the computer system, an operating task from the software component to the peripheral hardware device thereby freeing up host processor resources and increasing the overall efficiency of the computer system, the method comprising:

a step for enabling selected task offload capabilities of the peripheral hardware device to the extent such selected task offload capabilities are needed for one or more packets; and

in the event that an operating task to be performed for a packet by the software component corresponds to an enabled task offload capability on the peripheral hardware device, and depending on the then current needs of the computer system, performing the act of selectively offloading the operating task from the software component to the peripheral hardware device by sending a data packet to the peripheral hardware device indicating that the peripheral hardware device perform the specified operating task, the operating task being a task that peripheral hardware device is capable of performing.

2. (Original) A computer-readable medium having computer-executable instructions for performing the step and act recited in claim 1.

3. (Original) A method as recited in claim 1, wherein the peripheral hardware device is a network interface card (NIC) that is operatively connected to the computer system.

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4. (Original) A method as recited in claim 3, wherein the data packet sent to the NIC indicates that the NIC is to perform the specified operating task on the data packet sent to the NIC, the data packet sent to the NIC for dispatch on a network.

5. (Original) A method as recited in claim 3, wherein the data packet sent to the NIC indicates that the NIC is to perform the specified operating task on a data packet received by the NIC from the network.

6. (Original) A method as recited in claim 1, wherein the software component is a network software application executing in a layered network model.

7. (Original) A method as defined in claim 1, wherein the selected task offload capabilities of the peripheral hardware device are enabled by setting at least one flag indicator in a task offload buffer associated with the peripheral hardware device.

8. (Original) A method as defined in claim 1, wherein the packet is a network data packet comprising network data and packet extension data, wherein the packet extension data is comprised of at least one data field indicative of at least one operating task to be performed by the peripheral hardware device.

9. (Original) A method as defined in claim 8, wherein the peripheral hardware device is a Network Interface Card (NIC).

10. (Original) A method as defined in claim 1, wherein the operating task is selected from one or more of the following operating tasks: a checksum operation; an encryption operation; a message digest calculation operation; a TCP segmentation operation; a UDP segmentation operation; a decryption operation; a TCP packet assembly operation; a UDP packet assembly operation; a packet classification operation; and a Denial of Service filter operation.

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11. (Original) In a computer system environment having at least one software component and at least one peripheral hardware device, a method for dynamically offloading, on a per-packet basis and depending on the then current needs of the computer system, an operating task from the software component to the peripheral hardware device thereby freeing up host processor resources and increasing the overall efficiency of the computer system, the method comprising:

the act of the software component communicating with the peripheral hardware device to enable task offload capabilities on the peripheral device needed for one or more packets; and

in the event that an operating task to be performed for a packet by the software component corresponds to an enabled task offload capability on the peripheral hardware device, and depending on the then current needs of the computer system, performing the act of selectively offloading the operating task from the software component to the peripheral hardware device by sending a data packet to the peripheral hardware device indicating that the peripheral hardware device perform the specified operating task, the operating task being a task that peripheral hardware device is capable of performing.

12. (Original) A computer-readable medium having computer-executable instructions for performing the acts recited in claim 11.

13. (Original) A method as recited in claim 11, wherein the peripheral hardware device is a network interface card (NIC) that is operatively connected to the computer system.

14. (Original) A method as recited in claim 13, wherein the data packet sent to the NIC indicates that the NIC is to perform the specified operating task on the data packet sent to the NIC, the data packet sent to the NIC for dispatch on a network.

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15. (Original) A method as recited in claim 13, wherein the data packet sent to the NIC indicates that the NIC is to perform the specified operating task on a data packet received by the NIC from the network.

16. (Original) A method as recited in claim 11, wherein the software component is a network software application executing in a layered network model.

17. (Original) A method as defined in claim 11, wherein the selected task offload capabilities of the peripheral hardware device are enabled by setting at least one flag indicator in a task offload buffer associated with the peripheral hardware device.

18. (Original) A method as defined in claim 11, wherein the packet is a network data packet comprising network data and packet extension data, wherein the packet extension data is comprised of at least one data field indicative of at least one operating task to be performed by the peripheral hardware device.

19. (Original) A method as defined in claim 11, wherein the operating task is selected from one or more of the following operating tasks: a checksum operation; an encryption operation; a message digest calculation operation; a TCP segmentation operation; a UDP segmentation operation; a decryption operation; a TCP packet assembly operation; a UDP packet assembly operation; a packet classification operation; and a Denial of Service filter operation.

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20. (Original) A computer-program product for use in a computer system environment having at least one software component and at least one peripheral hardware device, the computer-program product for implementing a method for dynamically offloading, on a per-packet basis and depending on the then current needs of the computer system, an operating task from the software component to the peripheral hardware device thereby freeing up host processor resources and increasing the overall efficiency of the computer system, the computer-program product including a computer-readable medium having stored thereon computer-executable instructions for performing the following:

an act of communicating with the peripheral hardware device to enable task offload capabilities on the peripheral device needed for one or more packets; and

in the event that an operating task to be performed for a packet by the software component corresponds to an enabled task offload capability on the peripheral hardware device, and depending on the then current needs of the computer system, performing the act of selectively offloading the operating task from the software component to the peripheral hardware device by causing a data packet to be sent to the peripheral hardware device indicating that the peripheral hardware device perform the specified operating task, the operating task being a task that peripheral hardware device is capable of performing.

21. (Original) A computer-program product as recited in claim 20, wherein the computer-readable media is one or more physical storage media.

22. (Previously Presented) A network interface card configured to perform the following:

provide task offload capabilities of the network interface card to an operating system;

enable selected task offload capabilities, from among the provided task offload capabilities, to an extent they are needed for one or more data packets; and

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selectively and dynamically receive a data packet from the operating system that indicates that the network interface card, rather than the operating system, is to perform an operating task that would otherwise be performed by the operating system.

23. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to provide task offload capabilities of the network interface card by being configured to provide the location of a task offload buffer to the operating system.

24. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to provide task offload capabilities of the network interface card by being configured to provide task offload capabilities that are stored in a task offload buffer.

25. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to enable selected task offload capabilities by being configured to set at least one flag indicator in a task offload buffer associated with the network interface card.

26. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to enable selected task offload capabilities by being configured to process selection data received from the operating system.

27. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to selectively and dynamically receive a data packet from the operating system that indicates the network interface card is to perform an operating task by being configured to receive a network data packet that is transferred across a layered network model.

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28. (Previously Presented) The network interface card as recited in claim 27, wherein the network interface card is configured to receive a network data packet that is transferred across a layered network model by being configured to receive a network data packet that includes network data and packet extension data.

29. (Previously Presented) The network interface card as recited in claim 28, wherein the network interface card is configured to receive a network data packet that includes network data and packet extension data by being configured to receive a network data packet with packet extension data that includes at least one data field indicative of at least one operating task to be performed by the network interface card.

30. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to selectively and dynamically receive a data packet from the operating system that indicates the network interface card is to perform an operating task by being configured to perform an operating task that includes one or more of a checksum operation; an encryption operation; a message digest calculation operation; a TCP segmentation operation; a UDP segmentation operation; a decryption operation; a TCP packet assembly operation; a UDP packet assembly operation; a packet classification operation; and a Denial of Service filter operation.

31. (Previously Presented) The network interface card as recited in claim 22, wherein the network interface card is configured to selectively and dynamically receive a data packet from the operating system that indicates the network interface card is to perform an operating task by being configured to selectively and dynamically receive a data packet from the operating system that indicates the network interface card is to perform a batch of operating tasks.

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32. (Previously Presented) A network interface card configured to perform the following:

provide task offload capabilities of the network interface card to a software component;

receive selection data from the software component;

based on the received selection data, enable selected task offload capabilities, from among the provided task offload capabilities, to an extent they are needed for one or more data packets;

selectively and dynamically receive requests to perform operating tasks that are offloaded from an operating system, requests being received within data packets that indicate the network interface card is to perform the operating task; and

perform offloaded operating tasks at the network interface card.

33. (Previously Presented) A network interface card configured to perform the following:

provide task offload capabilities of the network interface card to a device driver associated with the network interface card;

receive data from the device driver that enables selected task offload capabilities to an extent they are needed for one or more data packets;

selectively and dynamically receive a data packet from the device driver that indicates that the network interface card, rather than the operating system, is to perform an operating task that would otherwise be performed by the operating system; and perform the operating task at the network interface card.

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34. (Previously Presented) In a network interface card, a method for dynamically performing, based on the current needs of a computer system, operating tasks that are offloaded from an operating system to the network interface card on a per-packet basis, thereby freeing up host processor resources and increasing the overall efficiency of the computer system, the method comprising the following:

an act of providing task offload capabilities of the network interface card to the operating system;

an act of selection data received from the operating system causing selected task offload capabilities, from among the provided task offload capabilities, to be enabled to an extent they are needed for one or more data packets; and

in the event that an operating task, to be otherwise performed for a data packet by the operating system, corresponds to an enabled task offload capability of the network interface card, and depending on the then current needs of the computer system, an act of a selectively and dynamically receiving a request from the operating system that the network interface card, rather than the operating system, perform the operating task, the request being received within a data packet from the operating system that indicates that the network interface card is to perform the operating task.

35. (Previously Presented) The method as recited in claim 34, wherein the act of providing task offload capabilities of the network interface card to the operating system, comprises the following:

an act of providing the location of a task offload buffer to the operating system.

36. (Previously Presented) The method as recited in claim 35, wherein the act of providing the location of a task offload buffer to the operating system, comprises the following:

an act of providing the location of a task offload buffer that identifies the task offload capabilities supported by the network interface card.

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37. (Previously Presented) The method as recited in claim 34, wherein the act of selection data received from the operating system causing selected task offload capabilities to be enabled comprises the following:

an act of selection data causing at least one flag indicator to be set in a task offload buffer associated with the network interface card.

38. (Previously Presented) The method as recited in claim 34, wherein the act of the network interface card receiving a selective and dynamic request that the network interface card perform the operating task, by receiving a data packet from the operating system comprises the following:

an act of the network interface card receiving a network data packet that is transferred across a layered network model.

39. (Previously Presented) The method as recited in claim 38, wherein the act of the network interface card receiving a network data packet that is transferred across a layered network model comprises the following:

an act of receiving a network data packet that includes network data and packet extension data.

40. (Previously Presented) The method as recited in claim 39, wherein the act an act of receiving a network data packet that includes network data and packet extension data comprises the following:

an act of receiving a network data packet, wherein the packet extension data includes at least a data field indicative of at least one operating task to be performed by the network interface card.

41. (Previously Presented) The method as recited in claim 34, wherein the operating task includes one or more of a checksum operation; an encryption operation; a message digest calculation operation; a TCP segmentation operation; a UDP segmentation operation; a

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decryption operation; a TCP packet assembly operation; a UDP packet assembly operation; a packet classification operation; and a Denial of Service filter operation.

42. (Previously Presented) In a network interface card, a method for dynamically performing, based on the current needs of a computer system, operating tasks that are offloaded from an operating system to the network interface card on a per-packet basis, thereby freeing up host processor resources and increasing the overall efficiency of the computer system, the method comprising the following:

a step for allocating operating tasks that may be performed on data packets at the network interface card;

in the event that an operating task, to be otherwise performed for a data packet by the operating system, corresponds to an enabled task offload capability of the network interface card, and depending on the then current needs of the computer system, an act of a selectively and dynamically receiving a request from the operating system that the network interface card, rather than the operating system, perform the operating task, the request being received within a data packet from the operating system that indicates that the network interface card is to perform the operating task.